

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during October—Continued

Altitude m. s. l. (m.)	RELATIVE HUMIDITY (%)											
	Broken Arrow, Okla. (233 m.)		Drexel, Nebr. (396 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)	
	Mean	De- parture from 7-yr. mean	Mean	De- parture from 9-yr. mean	Mean	De- parture from 4-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 7-yr. mean
Surface	65	-1	61	0	58	-4	74	+7	71	-2	67	+1
250	64	-2	58	-4	58	-4	74	+7	63	-7	67	+1
500	55	-7	58	-1	57	-5	71	+6	54	-12	60	-3
750	52	-9	52	-5	54	-8	60	0	53	-13	60	-1
1,000	51	-9	50	-5	52	-9	56	-2	53	-12	59	-1
1,250	52	-6	49	-4	50	-9	54	-2	53	-10	57	-1
1,500	52	-4	50	-2	48	-9	52	-1	49	-12	52	-3
2,000	49	-1	49	-3	42	-10	50	0	38	-17	48	-2
2,500	44	-1	47	-4	33	-11	50	+2	35	-15	48	+2
3,000	41	0	44	-5	31	-11	52	+5	32	-11	52	+9
3,500	43	+3	38	-9	29	-11	54	+7	31	-9	42	+1
4,000	39	+3	36	-9	28	-10	56	+11	31	-6	42	+1
4,500	32	+2	35	-8	28	-9	56	+11	36	-3	42	+1
5,000	34	-8	34	-8	28	-9	56	+11	36	-3	42	+1

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during October—Continued

Altitude m. s. l. (m.)	VAPOR PRESSURE (mb.)											
	Broken Arrow, Okla. (233 m.)		Drexel, Nebr. (396 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)	
	Mean	De- parture from 7-yr. mean	Mean	De- parture from 9-yr. mean	Mean	De- parture from 4-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 7-yr. mean
Surface	13.07	+0.12	10.19	+1.48	9.74	-1.61	8.70	+1.52	14.77	-1.49	11.52	+0.75
250	13.00	-0.15	9.53	-1.66	9.53	-1.66	8.70	+1.52	14.26	-1.36	11.39	+0.74
500	11.76	-0.18	8.94	+1.43	8.14	-1.92	8.60	+1.51	12.52	-1.58	9.92	-0.54
750	10.72	-0.15	8.94	+1.26	7.20	-2.07	8.14	+1.49	11.25	-1.83	9.10	-0.70
1,000	9.87	-1.08	8.21	+0.18	6.53	-2.02	7.51	+1.39	10.28	-1.66	8.39	-0.75
1,250	9.21	-0.41	7.59	+1.06	5.99	-1.71	6.83	+1.28	9.52	-1.26	7.38	-0.56
1,500	8.46	-0.56	7.13	+1.10	5.47	-1.38	6.08	+1.10	8.18	-1.44	6.36	-0.36
2,000	6.61	-0.63	6.12	-0.98	4.36	-1.08	4.96	+0.94	5.31	-2.01	4.92	+0.29
2,500	4.96	-0.41	5.00	-0.82	3.48	-0.63	4.03	-0.75	4.02	-1.71	4.24	+0.58
3,000	3.77	-0.30	3.90	-0.60	3.06	-0.39	3.40	-0.74	3.05	-1.25	3.81	+0.87
3,500	3.00	-0.27	2.99	-0.38	2.85	0.00	2.82	-0.65	2.32	-1.18	2.54	+0.20
4,000	2.12	-0.04	2.67	-0.45	2.63	+0.18	2.13	-0.45	1.94	-0.84	2.13	+0.20
4,500	1.47	-0.11	2.28	+0.51	2.49	+0.24	1.62	-0.84	1.47	-0.77	2.13	+0.20
5,000	1.99	+0.55	2.39	+0.29	2.39	+0.29	1.47	-0.77	1.47	-0.77	2.13	+0.20

TABLE 2.—Free-air resultant winds (m. p. s.) during October, 1924

Altitude, m. s. l. (meters)	Broken Arrow, Okla. (233 meters)				Drexel, Nebr. (396 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)			
	Mean		4-year mean		Mean		9-year mean		Mean		4-year mean		Mean		7-year mean		Mean		7-year mean		Mean		7-year mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface	S. 7° E.	5.1	S. 2° E.	2.5	S. 14° E.	2.9	S. 21° W.	1.6	N. 55° E.	5.5	N. 50° E.	2.8	S. 29° W.	1.7	N. 79° W.	1.6	S. 66° E.	1.8	S. 71° E.	0.9	S. 1° E.	2.2	S. 42° W.	2.2
250	S. 8° E.	5.2	S. 2° E.	2.7	S. 14° E.	2.9	S. 21° W.	1.6	N. 52° E.	5.6	N. 50° E.	3.2	S. 29° W.	1.7	N. 79° W.	1.6	S. 66° E.	1.8	S. 71° E.	0.9	S. 1° E.	2.2	S. 42° W.	2.2
500	S. 4° E.	7.2	S. 5° W.	3.8	S. 6° E.	3.1	S. 26° W.	2.1	N. 61° E.	8.5	N. 54° E.	4.4	S. 16° W.	2.5	W.	1.7	S. 25° E.	4.7	S. 27° E.	2.9	S. 27° W.	5.0	S. 61° W.	4.5
750	S. 2° W.	8.0	S. 10° W.	4.5	S. 7° W.	7.8	S. 36° W.	3.7	N. 64° E.	10.5	N. 61° E.	4.6	S. 18° W.	4.2	S. 85° W.	2.6	S. 18° E.	4.7	S. 17° E.	3.1	S. 52° W.	5.3	S. 61° W.	5.7
1,000	S. 7° W.	7.3	S. 18° W.	4.4	S. 12° W.	9.6	S. 46° W.	4.2	N. 57° E.	8.8	N. 61° E.	3.6	S. 27° W.	4.9	S. 86° W.	3.1	S. 14° E.	4.4	S. 8° E.	2.9	S. 70° W.	5.4	S. 68° W.	6.3
1,250	S. 19° W.	7.5	S. 31° W.	4.4	S. 22° W.	9.6	S. 54° W.	4.8	N. 59° E.	8.8	N. 68° E.	3.0	S. 32° W.	5.4	S. 87° W.	3.8	S. 17° E.	3.9	S. 2° W.	2.9	S. 74° W.	4.4	S. 72° W.	6.9
1,500	S. 21° W.	7.0	S. 39° W.	4.4	S. 26° W.	9.1	S. 62° W.	5.4	N. 59° E.	8.2	N. 68° E.	1.9	S. 39° W.	5.6	S. 87° W.	4.5	S. 27° E.	3.4	S. 15° W.	2.7	S. 79° W.	4.6	S. 76° W.	7.7
2,000	S. 24° W.	6.7	S. 46° W.	4.7	S. 40° W.	9.5	S. 72° W.	7.0	N. 61° E.	5.1	N. 20° E.	0.4	S. 51° W.	6.6	N. 89° W.	6.1	S. 22° E.	1.9	S. 41° W.	2.4	S. 84° W.	6.4	S. 80° W.	9.0
2,500	S. 33° W.	6.8	S. 59° W.	5.1	S. 48° W.	10.3	S. 76° W.	8.2	N. 43° E.	6.2	N. 69° W.	2.0	S. 47° W.	8.2	N. 85° W.	7.5	S. 2° W.	2.1	S. 52° W.	2.7	S. 89° W.	6.9	S. 85° W.	9.8
3,000	S. 37° W.	7.6	S. 63° W.	6.0	S. 61° W.	11.1	S. 81° W.	9.5	N. 42° E.	4.9	N. 88° W.	3.2	S. 49° W.	8.8	N. 86° W.	8.8	S. 17° W.	3.4	S. 57° W.	3.4	N. 83° W.	7.2	S. 87° W.	10.7
3,500	S. 54° W.	7.4	S. 70° W.	7.2	S. 50° W.	9.9	S. 87° W.	10.2	N. 26° E.	4.7	N. 81° W.	5.2	S. 49° W.	9.6	N. 87° W.	10.6	S. 31° W.	3.7	S. 46° W.	3.5	S. 89° W.	11.5	S. 84° W.	12.9
4,000	S. 46° W.	7.2	S. 62° W.	8.4	S. 69° W.	13.1	S. 86° W.	11.3	N. 20° E.	3.9	S. 87° W.	6.5	S. 51° W.	12.1	N. 89° W.	11.4	S. 52° W.	3.3	S. 49° W.	2.7	W.	18.0	S. 83° W.	12.2
4,500	S. 33° W.	3.4	S. 76° W.	9.0	S. 83° W.	15.8	N. 87° W.	12.2	N. 1° W.	1.9	N. 71° W.	5.7	S. 54° W.	14.8	S. 79° W.	13.3	S. 74° W.	8.9	S. 70° W.	2.2	W.	18.0	S. 83° W.	12.2
5,000	S. 45° E.	9.1	S. 71° W.	9.8	S. 72° W.	16.5	N. 85° W.	11.8	N. 47° W.	3.3	N. 34° W.	6.9	W.	14.8	S. 79° W.	13.3	S. 74° W.	8.9	S. 70° W.	2.2	W.	18.0	S. 83° W.	12.2

THE WEATHER ELEMENTS

By P. C. DAY, In Charge of Division

PRESSURE AND WINDS

The chief factor in the history of the weather for October, 1924, was the persistence of anticyclonic conditions that centered over the Ohio Valley and northeastern districts almost continuously during the month. This in large measure obstructed the eastward movements of cyclones that formed over the Southwest or entered the United States from the North Pacific, forcing them, after reaching the Great Plains, to pursue northerly courses, mostly to westward of Lake Superior, instead of their usual easterly or southeasterly courses into the Mississippi Valley and thence toward New England. As a result, no cyclone of importance crossed the central valleys and eastern districts, and the month as a whole over these districts was remarkably free from storms of any character. Moderate temperatures were the rule, sunshine was constant for long periods, little or no rain occurred, opportunity was afforded for late crops to mature, and all outdoor operations went forward without material interruption.

Among the cyclones that advanced from the far West and threatened the interior districts the most important were as follows:

On the 3d low pressure advanced from the British Northwest, and by the 4th it was central over western Kansas. High pressure to the eastward barred its further movement in that direction and it was forced northward, and by the morning of the 5th had advanced to the western end of Lake Superior. It was attended by rather general, but mostly light rains.

About the 8th a low-pressure area had advanced from the far Southwest to eastern Colorado, where it had attained considerable severity. High pressure moving southward over the Great Lakes again obstructed the eastward movement, and by the following morning the center had advanced to eastern North Dakota and precipitation had occurred over much of the central and northern Plains.

Promptly following the above, another disturbance pursued a similar course from the far Southwest and was central over western Colorado on the morning of the 11th, whence it also took a northerly and even northwesterly course over the Dakotas to the Canadian Provinces. This was attended by some heavy rains in northern Arizona on the 7th, by heavy snow in the mountains of Colorado on the 8th, and by general rains over the northern Rocky Mountains and the adjacent plains to the eastward.

The middle decade of the month, save as noted above, was remarkably free from stormy conditions in all parts

of the country, except along the immediate north Pacific coast where rains were somewhat frequent during the early part. By the end of the decade, however, a storm of tropical origin had moved from western Cuba to Florida and during the night of the 20th-21st crossed the southern portion of the peninsula, attended by high winds and heavy rainfall, a full report of which will be found elsewhere in this issue.

The last decade of the month was without important cyclonic activity from the Rocky Mountains eastward, save about the 26th and 27th, when a slight barometric depression moved over central Florida and northward along the Atlantic coast to the Chesapeake Bay region, attended by local light to moderate rains over most southeastern districts, and at the end of the month, when a cyclone moved from the middle Plains to the vicinity of western Lake Superior attended by mostly light rains over the middle and upper Mississippi Valley and the western portion of the upper Lake region.

Over the Pacific Coast States the last decade had frequent rains from northern California to Washington, and the last few days of the month brought needed rain to southern California and over much of the Plateau region.

The average pressure for the month was above normal over all eastern and practically all southern districts of the United States and over the eastern Canadian Provinces as far northward as observations extended, the center of highest pressure covering the Ohio Valley, lower Lake region, and northeastern districts.

From the northern Plains and central Rocky Mountain region westward to the Pacific average pressures were mainly below normal, and similar conditions existed in the western Canadian Provinces.

Due to the passage of a tropical storm over southern Florida, with attendant low pressures, the monthly averages over that area were slightly below normal.

The absence of cyclones over the central and eastern districts, save for the tropical storm that passed over southern Florida, favored an unusually stable condition of the atmosphere, and the wind movement was nearly everywhere light, in some instances the least of record for October. Local high winds were largely absent throughout the region, save over southern Florida in connection with the severe storm referred to above.

Due to persistent high pressure over the Ohio Valley and to the northeastward, the prevailing winds were mainly from the northeast over the Atlantic coast districts and East Gulf States and lower Ohio Valley, and from southerly points in most of the Great Plains, upper Mississippi Valley, and Great Lakes. Over the Dakotas and adjacent areas the prevailing winds, usually from cold northerly points at this season of the year, were mainly from the Southeast, carrying the warmer air of those regions far northward into the western Canadian Provinces.

TEMPERATURE

The month as a whole was notable for the small temperature variations, due mainly to the lack of important pressure changes. This was particularly the case over the districts from the Mississippi Valley eastward, where practically no daily change as great as 20° was observed until the last day of the month.

At the beginning of the month some unusually low temperatures prevailed over the eastern districts as an extensive cool area, overspreading the central and western districts at the close of September, moved eastward

to the Atlantic coast. Warmer weather immediately followed and the average temperature for the first week was not far from the normal, being generally below normal in the Southeast and Northwest, and slightly above in other portions.

The period from the 7th to 14th was mainly warm over the interior portions of the country, the average ranging up to nearly 10° above normal in the central valleys. Over the districts west of the Rocky Mountains the week was mainly cool, and it was cool over the Atlantic Coast States also.

The third week was warmer than normal over all parts of the country save in the extreme Northeast and over the middle and southern Plateau and Pacific coast sections. Over the central valleys this week, also, was abnormally warm, the averages ranging from 6° to 15° above the normal.

The last decade of the month was mainly warmer than normal over all northern districts until near the end, when decided changes to cooler occurred over the middle and southern Plateau and Rocky Mountain regions, advancing at the end of the month into the Great Plains and middle Mississippi Valley.

The periods of highest temperature were about the first of the month over most sections from the Great Plains westward, about the 3d to 5th over the Gulf States, and generally during the first decade over many of the remaining districts.

The lowest temperatures were confined mainly to the last decade, though west of the Rocky Mountains they occurred mostly from the 10th to 12th.

The average temperatures were above normal in all portions save over the Atlantic Coast States and the middle and southern Plateau and Pacific Coast States, where the month was slightly cooler than normal. Over the great central valleys and upper Lake region the month as a whole was decidedly warm, the averages ranging up to nearly 10° above normal, and this condition existed in the western Canadian Provinces also, as far north as observations are available at this time. At points in the Dakotas and surrounding States the month was the warmest of record for October, while farther south it was among the warmest.

PRECIPITATION

October was an unusually dry month over practically all the eastern half of the country, except in the Florida Peninsula. Much of the territory from the eastern Great Plains to the Atlantic coast had less than 1 inch of precipitation during the entire month, while a wide area from central Texas northeastward to the Ohio Valley, Great Lakes region, and Northeastern States had less than one-half inch. Many localities in this area had none or not more than a trace. Over much of this area it was the driest October in the periods of record, ranging up to 100 years or more in portions of New England and to 50 years or more locally in the Great Lakes region and southward over the Ohio Valley to the West Gulf States.

In portions of the lower Mississippi Valley and eastern Texas there was practically no rain and as several months preceding have been the driest, or among the driest, of record, the drought conditions at the end of the month were locally the severest known. Conditions only slightly less dry prevailed in many portions of the Ohio Valley, Lake region, and North Atlantic States, though here the precipitation of preceding months had been more generous, particularly over the Atlantic Coast States,

where heavy rains at the end of September thoroughly saturated the soil, so that, despite the lack of rain for unusual periods of time, the water supply was sufficient for current needs except in local areas, where severe shortage existed. The month was unusually favorable for forest fires in the East and these occurred to a considerable extent over the larger forested areas.

Over the districts from the Dakotas, western Nebraska, and Colorado to the Pacific coast, precipitation was mainly well distributed through the month and in sufficient quantity to meet present needs. In fact, at points near the coast from northern California to Washington the month was decidedly wet, some localities having the greatest precipitation of record in October, effectually ending one of the severest droughts ever known in that region. In California particularly, where drought had persisted for so many months, the water shortage was greatly relieved and the forest-fire hazard, which had become acute, was terminated for the season.

Over the Florida Peninsula precipitation was unusually heavy, particularly near and along the Atlantic coast, where the monthly amounts ranged up to nearly 40 inches. These heavy falls were mainly associated with the passage of the tropical storm that moved over the southern portion on the 20th and 21st, although many of the greatest daily falls occurred in connection with a period of unusually heavy precipitation from the 4th to 11th. Marked contrasts are shown in the total amounts of precipitation for different parts of the State, the extreme northwestern portion having in some cases less than a quarter of an inch, while nearly 40 inches were recorded on the middle eastern coast.

SEVERE LOCAL HAIL AND WIND STORMS, OCTOBER, 1924

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path (yards)	Value of property destroyed	Character of storm	Remarks	Authority
Portales, N. Mex. (6 miles east of)	2	2 p. m.			Whirlwind	Framework of Rogers school building demolished; one person badly injured.	The Mexican (Santa Fe, N. Mex.), Official, U. S. Weather Bureau.
Southern Florida	20-21				Tropical winds	Shipping delayed; chief damage to truck and citrus fruits. Citrus crop damaged to the extent of 1,000,000 boxes. Considerable property loss by flooding.	Do.
Black Hawk County, Iowa	30		100	\$75,000	Tornado and rain	Many plate-glass windows and trees broken; wire systems demoralized; buildings unroofed; merchandise damaged by rain.	Do.
Fayette County, Iowa	30				Wind	Many farm buildings wrecked, livestock killed, and considerable hay blown away.	Do.

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STORMS AND WEATHER WARNINGS

WASHINGTON FORECAST DISTRICT

The first storm warnings of the month were displayed on the Alabama, Mississippi, Louisiana, and extreme northwest Florida coast in connection with a disturbance of slight intensity that developed over the east-central portion of the Gulf of Mexico during the 11th-12th. It apparently moved almost directly westward for 24 to 36 hours and then was deflected toward the southwest by a strong area of high pressure that covered practically the entire United States. No strong winds were reported from the land stations, but one vessel in the north-central Gulf reported 56 miles an hour from the northeast on the 12th and another a short distance from Tampico, Mexico, reported the same velocity from the northwest on the 14th. Shortly thereafter the disturbance apparently was dissipated before reaching the coast of Mexico.

SNOWFALL

But little snow was reported during the month over the districts east of the Rocky Mountains. In the far West, over all central and northern portions, there was more or less snow, depending on elevation, the amounts ranging up to 40 inches or more in the Sierra of central California and to nearly 60 inches in the Cascades of Oregon. In the main system of the Rocky Mountains the amounts ranged up to 30 inches in the high ranges of Colorado and to somewhat less in the more northern portions.

RELATIVE HUMIDITY

The percentage of moisture in the atmosphere was much less than normal in the central and western Gulf States, and generally over the middle and southern Plains and the middle Mississippi and lower Ohio Valleys, also locally in the Middle Atlantic States. Elsewhere the departures from normal were not important, being mostly negative except over the Florida Peninsula and portions of the Pacific States and the Plateau region.

SUNSHINE AND CLOUDINESS

From the Great Plains eastward there was mainly abundant sunshine, except over the Florida Peninsula, where cloudy weather and rain prevailed to an unusual extent. In portions of the lower Mississippi Valley and West Gulf States sunshine ranged from 75 to 90 per cent of the possible. From the Rocky Mountains westward, sunshine was generally somewhat less, considerably so in the far Northwest, but this is to be expected.

At 9:20 p. m. of the 14th, when the last advisory warning regarding the disturbance described above was issued, the following additional information was included:

Reports from northwestern Caribbean Sea indicate disturbance is developing northwest of Swan Island. Caution advised vessels departing for Yucatan Channel.

From this time until the evening of the 22d, when the storm was centered in about latitude 28° N. and longitude 71° W., twice daily advisories were issued regarding its location, intensity, and direction of movement. Until the evening of the 17th, when the storm had reached the proportions of a hurricane and was central about 100 miles west-southwest of Swan Island, it was difficult to locate the storm center definitely. There was apparently some retrograde movement during the 16th-17th, as the wind at Swan Island, which was moderate to fresh southwest and west on the 15th, gradually backed to southeast with little change in velocity and with very slowly falling barometer. During the night of the